

FY07-LXI (61)-154

“Development of Biomimetic Membranes for Near-Zero PC Power Plant Emissions”

Submitted by: Carbozyme Inc.

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PARTICIPANTS

<u>Sponsor</u>	<u>Cost Share</u>
U.S. DOE	\$4,799,475
Carbozyme	\$ 130,049 (\$28,449 in-kind)
Siemens	\$ 41,679 (\$30,218 in-kind)
Novozymes	\$ 256,983 (\$74,926 in-kind)
Visage Energy	\$ 94,442 (\$44,642 in-kind)
SRI	\$ 44,063 (\$12,197 in-kind)
KES	\$ 16,400
Cogentrix Energy	\$ 72,000 (in-kind)
Otter Tail Energy	\$ 30,000
Great River Energy	\$ 30,000
MDU	\$ 30,000
OLI Systems	\$ 24,150
NDIC	<u>\$ 260,000</u>
Total Cost	\$5,832,241

Project Schedule – 3 years

Contract Date – 8/6/07

Start Date – 7/1/07

Completion Date – 12/31/09

Project Deliverables:

Status Reports:

10/1/07 (✓); 4/1/08 (✓);

10/1/08 (✓); 4/1/09 ();

Final Report: 1/31/10 ()

OBJECTIVE / STATEMENT OF WORK:

Evaluate and demonstrate the ability of a contained liquid membrane permeator to capture CO₂ from flue gas produced during the combustion of lignite.

STATUS

March 28 – September 30, 2007. A multi-step process was taken to identify the specific flue gas compositions. Lignite coals from three North Dakota mines were included in the flue gas analysis. A polishing scrubber would be needed and designed to reduce the SO_x to manageable levels for the liquid membrane permeator. Enzyme development tests are being designed. Discussions have commenced with prospective membrane manufacturers. Permeator scale-up design was started relative to heat transfer. A kick-off meeting with DOE was conducted in June.

October 1, 2008 – March 31, 2008. A report giving flue gas compositions for various coals and power plants was completed. EERC completed the design and ordering, and started the installation and construction of the pre-treatment scrubber. Enzyme immobilization onto a polypropylene surface was achieved. Novozymes produced a candidate enzyme for the HFCLM and has sufficient quantity with which to begin permeator testing. A relationship was established with preferred

membrane/module supplier. A 3-tubesheet test module for the permeator was completed and tested. All legal agreements with subcontractors were executed.

April 1, 2008 – September 30, 2008. EERC began fabricating and installing the pre-treatment scrubber. Enzyme providers have been identified and have submitted samples for testing. Researchers achieved a substantial increase in the duration and percent of immobilized enzyme activity that could be retained on a membrane surface. Successfully constructed and tested a 0.5 square meter 6-tubesheet permeator.